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different from those of Hering. In this case, however, the disturbance was apparently more serious, for the red and green of the perimetrical tests could not be seen on any part of the diseased half-retina, and the sensitiveness to white light was a little less than normal. The case, of course, justifies the same conclusions as Hering's above. In both cases a condition of things has been brought about on the central parts of the retina by disease, which exactly corresponds with that on the more peripheral parts of the normal eye.

The Knee-jerk and its Physiological Modifications. By Prof. H. P. BOWDITCH and Dr. J. W. WARREN. *Journal of Physiology*, XI, 1890, 25-64.

It has been known for some time that muscular contractions and various sensory and other conditions affecting the central nervous system could considerably re-inforce the knee-jerk, also that the re-inforcing contraction must precede the stroke upon the tendon by a certain interval. To the study of this point the experiments of the present paper were directed. The apparatus was somewhat complicated, but is marked by the clever devices common to Dr. Bowditch's laboratory, and is fully described. The general results may be summarized somewhat as follows: A voluntary muscular contraction (in response, after the manner of reaction-times, to a bell-stroke) increases the knee-jerk, if the blow on the ligament falls at the time of the contraction, and in lessening degree if it follow within 0.22-0.6 sec. A larger interval than this resulted in eight cases in a decrease of the knee-jerk below its normal amount, to which, however, it returned as the interval was extended to 1.7-2.5 secs. In 2 cases there was no such negative phase. In the majority of cases, therefore, contraction of the arm muscles produces for a short time a state of increased excitability in the part of the spinal cord that mediates the knee-jerk, followed in turn by a short period of decreased excitability. Sensory re-inforcements were investigated, by the explosion of torpedoes, the flashing of light into the eyes, a blast of air on the conjunctiva, on the nasal mucous membrane, on the neck, and on the knee. These experiments were tried on fewer subjects than the motor re-inforcements (3 or less) and the individual differences are marked. With a portion of the subjects there is a positive phase but hardly any negative, while in one both phases are plainly marked. The experiments were monotonous and in some the subject fell asleep. Oncoming drowsiness decreases the extent of both normal and re-inforced knee-jerks, and sound sleep abolishes them, an effect the opposite of that produced by the same conditions upon the superficial reflexes. The authors make the interesting suggestion that the individual variations in the activities of the central nervous system which their experiments show may open the way to an understanding of those general psycho-physic modes of response vaguely known as temperaments.

Zur Messung der Reactionszeit. OTTO DUMREICHER. Inaug. Diss., Strassburg, 1889.

Twenty-one pages of this dissertation are devoted to a historical résumé of "personal equation" and reaction-time studies, in particular of those among the latter where the stimulus used was electrical and applied to the skin. Another considerable section is devoted to the description of the apparatus used, which included several ingenious devices of Ewald's—among the rest a new chronoscope, and a reaction key which is so arranged that the stimulus can be applied to the tip of the finger with which the reaction is made. The chronoscope, which is a very promising instrument, consists essentially of an electro-magnet, the armature of which works upon a toothed wheel connected with a pointer moving over a dial. If, now, a tuning-fork interrupter is intro-

duced into the circuit with the magnet, each vibration of the tuning-fork causes an advance of the pointer one degree on the dial. The observer switches the fork into the circuit as the stimulus is applied, the subject switches it out when he feels the stimulus, and the time consumed is read off in the number of tuning-fork vibrations shown by the dial; *e. g.*, in hundredths of a second, if a tuning-fork making 100 vibrations a second is used, as in Dumreicher's experiments.

The aim of the experiments was the development of a method that should be simple enough, and at the same time give regular enough results, to make reaction-time tests readily useful in the clinique and laboratory. The recommendations are as follows: 1, Use a strong electric stimulus at the end of the finger with which the reaction is executed; 2, react by withdrawing the finger; 3, use for the warning signal a sound of short duration given 2 or 3 seconds before the stimulus; 4, take the single reactions in sets of 10, at 10-second intervals, with several minutes' rest between the sets; 5, in training the subject always tell him at the time the amount of each reaction; 6, in drawing the mean disregard the first 3 or 4 (always the same number) of the series. The reactions by withdrawing the finger are not only more regular but shorter by 0.03—0.04 sec. than those by pressing the key, probably because more nearly like the natural reflex retractions.

The Time-relations of Mental Phenomena. JOSEPH JASTROW. Fact and Theory Papers, No. VI, published by N. D. C. Hodges, N. Y., 1890, p. 60.

Those that are familiar with Prof. Jastrow's unusual skill in presenting the results of psychological experimentation in concise and intelligible form, need not be told that this little monograph is excellent in both respects. We have no hesitation in saying that it is the best general account of the subject extant, both as regards the maintenance of proper perspective and as regards the extent and freshness of the material gathered. The book provides for those that wish to consult original sources by a classified bibliography of some fifty-seven titles. It should be useful to all those that contemplate psychology from the experimental or clinical side.

IV.—MISCELLANEOUS.

The Principles of Psychology. By WILLIAM JAMES, Professor of Psychology in Harvard University. Henry Holt & Co., 1890. Two volumes, pp. 689 and 704.

This long promised, long delayed book appeared in October last. Its size and the volume of matter it contains as well as its rare vigor and acumen makes the task of the conscientious reviewer hard.

Important as are our differences *in re*, and abrupt and summary as space limits compel us to seem *in modo* let no reader forget that gratitude and admiration are predominant. Our indebtedness for stimulus and self definition to both the man and his book are very great.

The book opens with an excellent chapter on the functions of the brain¹ which is a good illustration of the way in which such subjects as speech disorders, reaction-times, the psychology of vision, the phenomena of suggestion and trance, the psycho-physic law, etc., should have been handled, instead of being broken up and treated, parts here, parts there, torn from their natural and usual connections to be brought to bear upon the speculative controversies in which the author's interest centres. Habit is then treated in a general yet chiefly hortatory way. We are told to do something every day because we do not wish to do it to keep the faculty of *effort* (one of the supremest things in this treatise) alive. We must begin early and hand over all we can to our automaton. In treating the automaton it is urged that the mind is not an epiphenomenon. If feelings cannot

¹ See page 551 in this number of the JOURNAL.